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EXAMINER

ALEJANDRO MULERO, LUZ L

ART UNIT PAPER NUMBER

1763

DATE MAILED: 02/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 09/689,814	<b>Applicant(s)</b> CHUNG ET AL.	
	<b>Examiner</b> Luz L. Alejandro	<b>Art Unit</b> 1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 23 October 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 7-11, 38-41 and 43-49 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 7-11, 38-41 and 43-49 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 7, 9, 11, 38, 41, 44, 47, and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ballance et al., U.S. Patent 5,781,693 in view of Moore et al., U.S. Patent 5,444,217.

Ballance et al. shows the invention substantially as claimed including a semiconductor manufacturing apparatus comprising: a susceptor installed at a lower portion of the processing chamber for receiving a wafer 16; means 44 for annealing the wafer, said means being installed at an upper portion of the processing chamber (see

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col. 3-lines 47-62); and a gas diffuser porous plate 52 installed below the wafer annealing means, for supplying reaction gases into the process chamber which is in flow contact with a gas supply line (see fig. 1 and col. 3-line 39 to col. 5-line 30).

Ballance et al. fails to expressly disclose that the susceptor is vertically movable. Moore et al. discloses a vertically movable susceptor 212 installed at a lower portion of the processing chamber 209 for receiving a wafer thereon (see fig. 2A and col. 9-lines 24-48). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Ballance et al. so as to include the vertically movable susceptor of Moore et al. in order to allow for easy loading and removal of the wafer.

Claims 8, 43, and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ballance et al., U.S. Patent 5,781,693 in view of Moore et al., U.S. Patent 5,444,217 as applied to claims 7, 9, 11, 38, 41, 44, 47, and 49 above, and further in view of Yin et al., U.S. Patent 6,189,484.

Ballance et al. and Moore et al. are applied as above but fail to expressly disclose a cooling line contained within the susceptor. Yin et al. discloses an apparatus with a heating element 170 in the upper portion of the processing chamber whereby the susceptor 137 can also contain a cooling line therein (see col. 6-lines 9-11). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Ballance et al. modified by Moore et

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al. so as to include the cooling line of Yin et al. because this allows for better temperature control of the wafer.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ballance et al., U.S. Patent 5,781,693 in view of Moore et al., U.S. Patent 5,444,217 as applied to claims 7, 9, 11, 38, 41, 44, 47, and 49 above, and further in view of Shang et al., U.S. Patent 6,182,603.

Ballance et al. and Moore et al. are applied as above but fail to expressly disclose that the gases are supplied to the gas supply line from pipes comprising: a) a first pipe having a microwave guide for changing a gas mixture containing a hydrogen gas and a fluorine-containing gas in a predetermined ratio, or the hydrogen gas only, into a plasma state, and b) a second pipe for supplying the fluorine-containing gas into the processing chamber. Shang et al. discloses a first pipe containing a sapphire tube 77 that is coupled to a microwave guide 68 for exciting a gas into a plasma and a second pipe 53 for supplying gas to the processing chamber (see Fig. 1 and col. 4-line 15 to col. 5-line 46). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Ballance et al. modified by Moore et al., so as to include the pipe structure of Shang et al. because this will result in the capability of cleaning the apparatus without causing the damage that sometimes occurs when generating plasma in the processing chamber (see col. 2-lines 36-62 of Shang et al.).

With respect to the particular gas being transported through the pipes, such limitation is directed to a method limitation instead of an apparatus limitation, and since an apparatus is being claimed the method limitations are not given patentable weight. The method limitations are considered intended uses that do not patentably distinguish an apparatus claim. The apparatus of Ballance et al. modified by Moore et al. and Shang et al. is capable of supplying the specific claimed gases, through the pipes, to the apparatus.

Claims 39-40 and 45-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ballance et al., U.S. Patent 5,781,693 in view of Moore et al., U.S. Patent 5,444,217 as applied to claims 7, 9, 11, 38, 41, 44, 47, and 49 above, and further in view of Collison et al., U.S. Patent 6,203,657.

Ballance et al. and Moore et al. are applied as above but fail to expressly disclose wherein the gas diffuser is connected to two separate pipes extending outside of said processing chamber, one of the two pipes being adapted to supply to the gas diffuser a first gas excited to a plasma state and another of the two pipes being adapted to supply to the gas diffuser a second gas that is in a non-plasma state. Collison et al. discloses a gas diffuser 124 connected to two separate pipes extending outside of said processing chamber, one of the two pipes 108 being adapted to supply to the gas diffuser a first gas excited to a plasma state and another of the two pipes 222 being adapted to supply to the gas diffuser a second gas that is in a non-plasma state (see figs. 2B and 3 and col. 7-line 12 to col. 8-line 26). In view of this disclosure, it would

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have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Ballance et al. apparatus modified by Moore et al. so as to include the gas diffuser structure of Collison et al. because such an apparatus would allow more flexibility as to the processes being conducted within the apparatus, and can provide for a longer life of the apparatus.

Claims 7, 11, 38, 41, 44, and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thakur, U.S. Patent 5,863,327 in view of Moore et al., U.S. Patent 5,444,217.

Thakur shows the invention substantially as claimed including a semiconductor manufacturing apparatus comprising: a susceptor 5 installed at a lower portion of a processing chamber for receiving a wafer thereon; means 1 for annealing the wafer on a holder 5, said means being installed at an upper portion of the processing chamber (see fig. 1); and a gas inlets 6,7 installed below the wafer annealing means (see fig. 1 and col. 3-line 4 to col. 3-lines 4-30).

Thakur fails to expressly disclose that the susceptor is vertically movable and a gas diffuser installed below the wafer annealing means. Moore et al. discloses a vertically movable susceptor 212 installed at a lower portion of the processing chamber 209 for receiving a wafer thereon and a gas diffuser 207 installed below the wafer annealing means (see fig. 2A and col. 9-lines 24-48). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Thakur so as to include the vertically movable susceptor and

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the gas diffuser of Moore et al. in order to allow for easy loading and removal of the wafer, and to allow uniform gas distribution throughout the wafer surface, respectively.

Claims 9 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thakur, U.S. Patent 5,863,327 in view of Moore et al., U.S. Patent 5,444,217 as applied to claims 7, 11, 38, 41, 44, and 47 above, and further in view of Ballance et al., U.S. Patent 5,781,693.

Thakur and Moore et al. are applied as above but fail to expressly disclose a porous plate forming the bottom of the gas diffuser, wherein the diffuser is in flow contact with the gas supply line. Ballance et al. discloses a gas diffuser porous plate 52 installed below the wafer annealing means, for supplying reaction gases into the process chamber which is in flow contact with the gas supply line (see fig. 1 and col. 3-line 39 to col. 5-line 30). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Thakur modified by Moore et al. so as to include a porous plate as part of the gas diffuser because in such a way the gases will be more evenly distributed over the substrate surface.

Claims 8, 43, and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thakur, U.S. Patent 5,863,327 in view of Moore et al., U.S. Patent 5,444,217 as applied to claims 7, 11, 38, 41, 44, and 47 above, and further in view of Yin et al., U.S. Patent 6,189,484.



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Thakur and Moore et al. are applied as above but fail to expressly disclose a cooling line contained within the susceptor. Yin et al. discloses an apparatus with a heating element 170 in the upper portion of the processing chamber whereby the susceptor 137 can also contain a cooling line therein (see col. 6-lines 9-11). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Thakur modified by Moore et al. so as to include the cooling line of Yin et al. because this allows for better temperature control of the wafer.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Thakur, U.S. Patent 5,863,327 in view of Moore et al., U.S. Patent 5,444,217 as applied to claims 7, 11, 38, 41, 44, and 47 above, and further in view of Shang et al., U.S. Patent 6,182,603.

Thakur and Moore et al. are applied as above but fail to expressly disclose that the gases are supplied to the gas supply line from pipes comprising: a) a first pipe having a microwave guide for changing a gas mixture containing a hydrogen gas and a fluorine-containing gas in a predetermined ratio, or the hydrogen gas only, into a plasma state, and b) a second pipe for supplying the fluorine-containing gas into the processing chamber. Shang et al. discloses a first pipe containing a sapphire tube 77 that is coupled to a microwave guide 68 for exciting a gas into a plasma and a second pipe 53 for supplying gas to the processing chamber (see Fig. 1 and col. 4-line 15 to col. 5-line 46). In view of this disclosure, it would have been obvious to one of ordinary skill in the

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art at the time the invention was made to modify the apparatus of Thakur modified by Moore et al., so as to include the pipe structure of Shang et al. because this will result in the capability of cleaning the apparatus without causing the damage that sometimes occurs when generating plasma in the processing chamber (see col. 2-lines 36-62 of Shang et al.).

With respect to the particular gas being transported through the pipes, such limitation is directed to a method limitation instead of an apparatus limitation, and since an apparatus is being claimed the method limitations are not given patentable weight. The method limitations are considered intended uses that do not patentably distinguish an apparatus claim. The apparatus of Thakur modified by Moore et al. and Shang et al. is capable of supplying the specific claimed gases, through the pipes, to the apparatus.

Claims 39-40 and 45-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thakur, U.S. Patent 5,863,327 in view of Moore et al., U.S. Patent 5,444,217 as applied to claims 7, 11, 38, 41, 44 and 47 above, and further in view of Collison et al., U.S. Patent 6,203,657.

Thakur and Moore et al. are applied as above but fail to expressly disclose wherein the gas diffuser is connected to two separate pipes extending outside of said processing chamber, one of the two pipes being adapted to supply to the gas diffuser a first gas excited to a plasma state and another of the two pipes being adapted to supply to the gas diffuser a second gas that is in a non-plasma state. Collison et al. discloses a gas diffuser 124 connected to two separate pipes extending outside of said

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processing chamber, one of the two pipes 108 being adapted to supply to the gas diffuser a first gas excited to a plasma state and another of the two pipes 222 being adapted to supply to the gas diffuser a second gas that is in a non-plasma state (see figs. 2B and 3 and col. 7-line 12 to col. 8-line 26). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Thakur apparatus modified by Moore et al. so as to include the gas diffuser structure of Collison et al. because such an apparatus would allow more flexibility as to the processes being conducted within the apparatus, and can provide for a longer life of the apparatus.

Claims 7, 11, 38, 41, 44, and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawasumi et al., U.S. Patent 4,936,940 in view of Moore et al., U.S. Patent 5,444,217.

Kawasumi et al. shows the invention substantially as claimed including a semiconductor manufacturing apparatus comprising: a susceptor 5 installed at a lower portion of a processing chamber for receiving a wafer 1 thereon; means 3 for annealing the wafer, said means being installed at an upper portion of the processing chamber (see fig. 1); and a gas inlet 4 installed below the wafer annealing means (see fig. 1 and col. 2-line 34 to col. 3-line 16).

Kawasumi et al. fails to expressly disclose that the susceptor is vertically movable and a gas diffuser installed below the wafer annealing means. Moore et al. discloses a vertically movable susceptor 212 installed at a lower portion of the

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processing chamber 209 for receiving a wafer thereon and a gas diffuser 207 installed below the wafer annealing means (see fig. 2A and col. 9-lines 24-48). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kawasumi et al. so as to include the vertically movable susceptor and the gas diffuser of Moore et al. in order to allow for easy loading and removal of the wafer, and to allow uniform gas distribution throughout the wafer surface, respectively.

Claims 9 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawasumi et al., U.S. Patent 4,936,940 in view of Moore et al., U.S. Patent 5,444,217 as applied to claims 7, 11, 38, 41, 44, and 47 above, and further in view of Ballance et al., U.S. Patent 5,781,693.

Kawasumi et al. and Moore et al. are applied as above but fail to expressly disclose a porous plate forming the bottom of the gas diffuser, wherein the diffuser is in flow contact with the gas supply line. Ballance et al. discloses a gas diffuser porous plate 52 installed below the wafer annealing means, for supplying reaction gases into the process chamber which is in flow contact with the gas supply line (see fig. 1 and col. 3-line 39 to col. 5-line 30). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kawasumi et al. modified by Moore et al. so as to include a porous plate as part of the gas diffuser because in such a way the gases will be more evenly distributed over the substrate surface.

Claims 8, 43, and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawasumi et al., U.S. Patent 4,936,940 in view of Moore et al., U.S. Patent 5,444,217 as applied to claims 7, 11, 38, 41, 44, and 47 above, and further in view of Yin et al., U.S. Patent 6,189,484.

Kawasumi et al. and Moore et al. are applied as above but fail to expressly disclose a cooling line contained within the susceptor. Yin et al. discloses an apparatus with a heating element 170 in the upper portion of the processing chamber whereby the susceptor 137 can also contain a cooling line therein (see col. 6-lines 9-11). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kawasumi et al. modified by Moore et al. so as to include the cooling line of Yin et al. because this allows for better temperature control of the wafer.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawasumi et al., U.S. Patent 4,936,940 in view of Moore et al., U.S. Patent 5,444,217 as applied to claims 7, 11, 38, 41, 44, and 47 above, and further in view of Shang et al., U.S. Patent 6,182,603.

Kawasumi et al. and Moore et al. are applied as above but fail to expressly disclose that the gases are supplied to the gas supply line from pipes comprising: a) a first pipe having a microwave guide for changing a gas mixture containing a hydrogen gas and a fluorine-containing gas in a predetermined ratio, or the hydrogen gas only,

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into a plasma state, and b) a second pipe for supplying the fluorine-containing gas into the processing chamber. Shang et al. discloses a first pipe containing a sapphire tube 77 that is coupled to a microwave guide 68 for exciting a gas into a plasma and a second pipe 53 for supplying gas to the processing chamber (see Fig. 1 and col. 4-line 15 to col. 5-line 46). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kawasumi et al. modified by Moore et al., so as to include the pipe structure of Shang et al. because this will result in the capability of cleaning the apparatus without causing the damage that sometimes occurs when generating plasma in the processing chamber (see col. 2-lines 36-62 of Shang et al.).

With respect to the particular gas being transported through the pipes, such limitation is directed to a method limitation instead of an apparatus limitation, and since an apparatus is being claimed the method limitations are not given patentable weight. The method limitations are considered intended uses that do not patentably distinguish an apparatus claim. The apparatus of Kawasumi et al. modified by Moore et al. and Shang et al. is capable of supplying the specific claimed gases, through the pipes, to the apparatus.

Claims 39-40 and 45-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawasumi et al., U.S. Patent 4,936,940 in view of Moore et al., U.S. Patent 5,444,217 as applied to claims 7, 11, 38, 41, 44 and 47 above, and further in view of Collison et al., U.S. Patent 6,203,657.

Kawasumi et al. and Moore et al. are applied as above but fail to expressly disclose wherein the gas diffuser is connected to two separate pipes extending outside of said processing chamber, one of the two pipes being adapted to supply to the gas diffuser a first gas excited to a plasma state and another of the two pipes being adapted to supply to the gas diffuser a second gas that is in a non-plasma state. Collison et al. discloses a gas diffuser 124 connected to two separate pipes extending outside of said processing chamber, one of the two pipes 108 being adapted to supply to the gas diffuser a first gas excited to a plasma state and another of the two pipes 222 being adapted to supply to the gas diffuser a second gas that is in a non-plasma state (see figs. 2B and 3 and col. 7-line 12 to col. 8-line 26). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Kawasumi et al. apparatus modified by Moore et al. so as to include the gas diffuser structure of Collison et al. because such an apparatus would allow more flexibility as to the processes being conducted within the apparatus, and can provide for a longer life of the apparatus.

### ***Response to Arguments***

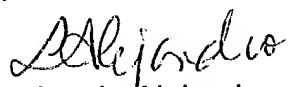
Applicant's arguments with respect to claims 7-11, 38-41, and 43-49 have been considered but are moot in view of the new ground(s) of rejection.

**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luz L. Alejandro whose telephone number is 571-272-1430. The examiner can normally be reached on Monday to Thursday from 7:30 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory L. Mills can be reached on 571-272-1439. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Luz L. Alejandro  
Primary Examiner  
Art Unit 1763

February 23, 2004